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## California Five-Spined Ips

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The California five-spined ips (*Ips confusus* Le Conte) is one of the most aggressive pine engraver beetles, attacking nearly all pine species. Its activity is greatest during periods when abundant slash results from logging or land-clearing operations and from wind-falls or snow breakage, but sometimes sporadic attacks occur without evident association with slash.

### Economic Importance

During outbreaks many thousands of trees are killed from midsummer to fall; they occur in varying-sized groups which often exceed 500 trees. Infestations are confined primarily to saplings, poles, and young sawtimber trees under 26 inches d.b.h. Frequently many of the older trees are top-killed. *Ips confusus* is most destructive in young second-growth ponderosa pine at elevations ranging from 2,000 to 4,500 feet.

This insect is often associated with the western pine beetle (*Dendroctonus brevicomis* Le Conte), and at times killing actually done by both species is blamed entirely on the western pine beetle. Hence, there are no reliable estimates of timber losses caused by *Ips confusus* alone.

NOTE: This leaflet supersedes Forest Pest Leaflet 4, "California Five-Spined Engraver Beetle" (same species). The range of this beetle has been extended in accordance with recommendation of G. R. Hopping (see reference, p. 4).

The California five-spined ips is found principally in California, Arizona, Utah, Colorado, New Mexico, and northern Mexico (fig. 1).

### Host Material

This beetle prefers fresh slash rather than living trees from early spring until midsummer. This material absorbs most of the adults that emerge from mid-April or earlier to mid-July. Large beetle populations develop especially in cut tree tops and

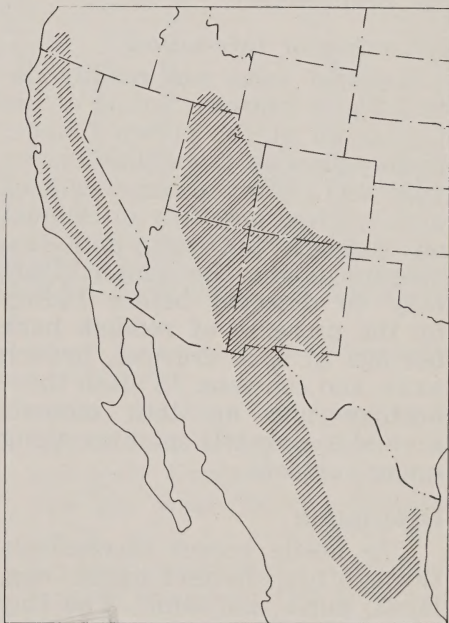


Figure 1.—Generalized distribution of the California five-spined ips.

other stems over 3 inches in diameter.

Adults which emerge from slash after midsummer attack and kill living trees. However, the number of trees attacked and the severity of the attacks are influenced by the presence or lack of fresh slash in the area, and apparently by the general condition of the stand. A general stand weakness may be caused by deficient soil moisture, resulting from subnormal spring precipitation.

The host trees which are attacked and killed or top-killed are primarily ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), Coulter pine (*P. coulteri*), and Monterey pine (*P. radiata*). Attacks and broods have been reported in western white pine (*P. monticola*), knobcone pine (*P. attenuata*), foxtail pine (*P. balfouriana*), Jeffrey pine (*P. jeffreyi*), pinyon pine (*P. monophylla*), Digger pine (*P. sabini-ana*), and Mexican pinyon pine (*P. cembroides*).

### Evidences of Infestation

Infested trees are readily detectable by uniform fading of the top or all of the crown foliage, from yellowish to reddish brown (fig. 2A). They become evident usually from late July or August on through the fall, and frequently during the winter. They may be detected before fading by the presence of reddish bark borings in bark crevices, branch axils, and cobwebs. In slash these borings pile up into mounds around each beetle entrance along upper surfaces.

### Description

The beetle passes successively through four distinct stages: egg, larva, pupa, and adult. The tiny cylindrical eggs are pearly white. They hatch into yellowish white, legless grubs or larvae, which,

when fully grown, transform to whitish, quiescent pupae, then to adults. The adults, each about the size of a rice grain,  $\frac{3}{16}$  to  $\frac{1}{5}$  inch long, are pale yellow at first, but change within 2 weeks during summer to dark reddish brown and black. At about 65° F. they emerge and fly readily to new fresh slash or living trees.

### Life History and Habits

The overwintering stages are predominantly callow to mature adults, pupae, and mature larvae. They remain under the bark of trees or slash during this dormant period. Ordinarily the overwintered adults make the initial spring attacks in the central part of the range by mid-April. Attacks occur constantly until early November, with peak adult flights on or about May 10, June 25, August 10, and September 25.

Each attack is begun by a male beetle which bores a nuptial chamber, 2 to 3 times his size, in the inner bark. He is soon joined by 2 to 5 females, usually 3, each of which constructs a single straight egg tunnel, 4 to 6 inches long. These tunnels lead out from the nuptial chamber in 3 directions, in a typical inverted tuning fork pattern (fig. 2C).

Parent adults commonly re-emerge within 20 to 30 days after the initial attack, varying in time with the degree of crowding. These adults make a second attack and produce another brood.

Eggs hatch within 5 to 14 days. The larvae mine within the inner bark (phloem) at right angles to the egg tunnel, and when fully grown (in 14 to 21 days) they pupate in individual cells hollowed out in the phloem tissue. As the adults emerge from these cells, they congregate in numbers beneath the bark until mature, then bore to the outside, many leaving through the same exit hole.

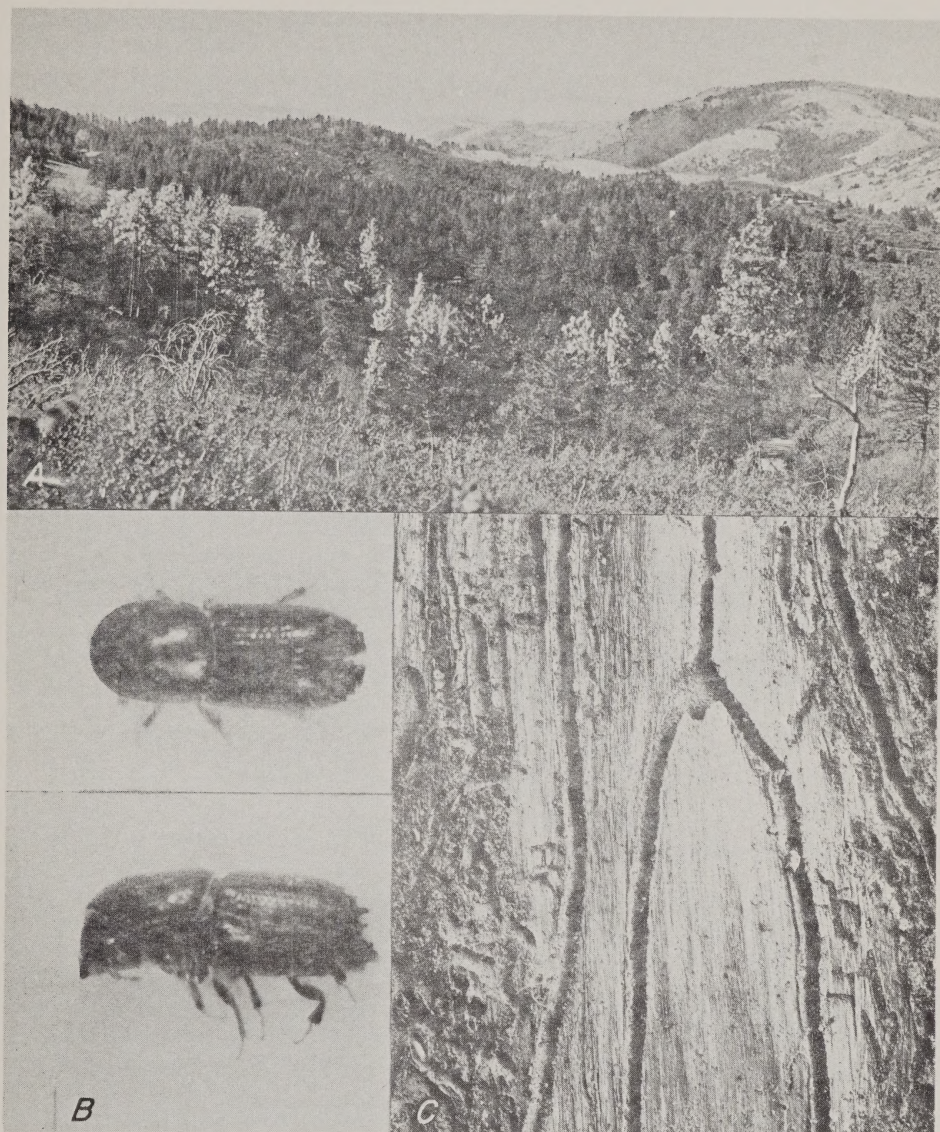


Figure 2.—California five-spined ips: A, aggressive killing in Coulter pine; B, adult, 8 times natural size; C, egg galleries in soft inner bark.

Frequently mass attacks are made during midsummer and fall in sapling and pole-size trees. In such instances, adults numbering from 200 to 500 per square foot of bark surface feed gregariously in the phloem, rarely producing broods. Re-emergence occurs within 3 weeks from summer invasions; those invading in the fall remain under the bark until spring before re-emerging.

The number of generations varies from two per year in the northerly limits of the range to five per year in the southerly limits, with an average of three to four generations throughout most of the range. One generation more or less than the average for a given locality is apt to occur as a result of seasonal variations in temperature.

## Natural Control

A number of insect enemies and associates, mites, fungi, and micro-organisms follow closely behind successful attacks, to prey upon, parasitize, and compete with the young developing beetle broods for food. The combined effect of all these organisms, and in addition the adverse effect of prolonged high or low temperature and excessive or too little moisture, tend to hold the beetle populations in check. However, these control factors never occur in combinations sufficient to eradicate *Ips* populations completely.

## Preventive Control

Wherever possible the cutting of green ponderosa pine or other pines at elevations between 2,000 and 4,500 feet should be avoided until midsummer. This will prevent the buildup of excessive populations from overwintered adults under the optimum rearing conditions of this elevation range, where drought factors most often weaken tree resistance to attacks.

The amount of breeding in green slash is reduced to a minimum by exposing to direct sunlight, by lopping and scattering limbs, by applying toxic-oil sprays to bark surfaces, or by peeling within 10 to 15 days after the slash is created during spring and summer. Slash from winter windfall and snow breakage should be treated to prevent breeding or to destroy broods before May 1.

## Applied Control

Direct control is usually unnecessary unless outbreaks occur in combination with the western pine beetle and the latter species threatens to become epidemic. When warranted, salvage logging or toxic residual sprays may be used during the fall, winter, and spring.

Salvage logging removes infested logs to the mill, where broods are destroyed in the burner during the milling process. Its effectiveness is limited by the number of infested trees that can be removed from the woods and processed at the mill before the beetles emerge.

The spray recommended is a 1.5 percent solution of lindane in diesel oil. Infested trees are felled, and before the beetles emerge all bark surfaces are sprayed until wet. Lindane often is available as a 20 percent concentration (1.4 lbs./gal.). A 1.5 percent solution is made by adding 1 volume of the concentrate to 12.5 volumes of diesel oil. One gallon of the prepared spray covers 50 to 60 square feet of bark area. Maximum effectiveness requires thorough application.

**Caution:** Lindane is a poisonous compound; careless use can endanger people, domestic animals, wildlife, and fish directly and by contaminating water supplies. Follow all directions and heed all warnings on the container label. Wear protective clothing. Avoid spilling, contact with the skin, or excessive inhalation. Wash exposed skin with soap and water. Always mix and apply formulations in the open.

## References

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